CURRICULUM VITAE, JAN SPITSBERGEN

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EDUCATION:

Michigan State University, B.S. in Fisheries and Wildlife, March 1976. Major field of study fisheries and limnology, minor biochemistry.

Michigan State University College of Veterinary Medicine, D.V.M., June, 1980.

Cornell University, Ph.D. in immunology and pathology, January, 1986. Minor field of study toxicology.

RESEARCH AND PROFESSIONAL EXPERIENCE:

1980 Aquavet, a course in aquatic veterinary medicine, Marine Biological Laboratory, Woods Hole, MA.
1980 Research Associate, Marine Biological Laboratory, Woods Hole, MA.
1980-1982 Intern, then resident, Department of Veterinary Pathology, Cornell University, Ithaca, NY.
1982-1986 Research Assistant (Ph.D. Candidate) in Departments of Veterinary Pathology and Avian and Aquatic Animal Medicine, Cornell University, Ithaca, NY.
1986-1988 Research Associate, School of Pharmacy, University of Wisconsin, Madison
1988-1995 Assistant Professor, Department of Avian and Aquatic Animal Medicine, Cornell University, Ithaca, NY.
1990 Recombinant DNA Techniques Workshop, Life Technologies, Inc., Germantown, MD.
1991 Morphometry in Pathology and Toxicology Short Course, Princeton, NJ.
1993 Microinjection Short Course at Marine Biological Laboratory, Woods Hole, MA.
1993 Participated in NIH Study Section regarding use of small aquarium fish in carcinogenesis studies.
1997 Ultrastructural Pathology in Toxicologic Diseases Workshop, Iowa State University, Ames, IA
1999 Laboratory Short Course in Molecular Biology Techniques, Oregon State University
1995-1999 Research Associate, Department of Food Science and Technology--(Toxicology Group Reorganized as Dept. Environmental and Molecular Toxicology Jan 1998), Oregon State University, Corvallis, OR.
2000-2005 Research Assistant Professor, Dept. Environmental and Molecular Toxicology,

Oregon State University, Corvallis, OR.

2005-present Research Assistant Professor, Center for Fish Disease Research, Oregon State University, Corvallis, OR.

HONORS, AWARDS, CERTIFICATIONS AND PROFESSIONAL ACTIVITY

Phi Zeta, June, 1979; Catherine Patton Award in Veterinary Physiology, June, 1978; Phi Kappa Phi Honor Society, March, 1976; Diplomate, American College of Veterinary Pathologists, 1987; Ph.D. stipend funding through National Institute of Environmental Health Sciences-funded Environmental Pathology training grant in Department of Veterinary Pathology at the College of Veterinary Medicine at Cornell University; Most Significant Paper in Journal of Aquatic Animal Health in 1995 (7:269-283) and in 2004 (16:116-129); Member of American Veterinary Medical Association, American College of Veterinary Pathologists, Fish Health Section of American Fisheries Society, Society of Toxicologic Pathology, American Association for the Advancement of Science

BIBLIOGRAPHY:

First Author Journal Articles

Spitsbergen, J.M., Blazer, V.S., Bowser, P.R., Cheng, K.C., Cooper, K.R., Cooper, T.K., Frasca, S., Groman, D.B., Harper, C.M., Law, J.M., Marty, G.D., Smolowitz, R.M., St. Leger, J., Wolf, D.C., Wolf, J.C. 2008 in press. Finfish and aquatic invertebrate pathology resources for now and the future. Comparative Biochemistry and Physiology, Part C.

Spitsbergen, J.M. 2007. Imaging neoplasia in zebrafish. Nature Methods 4: 2-3.

Spitsbergen, J.M. and M.L. Kent. 2003. The state of the art of the zebrafish model for toxicology and toxicologic pathology research—advantages and current limitations. Toxicol. Pathol. 31 (Suppl.), 62-87.

Spitsbergen, J.M., Tsai, H., Reddy, A.R., Arbogast, D., Miller, T., Hendricks, J.D, and Bailey, G.S. 2000. Neoplasia in zebrafish treated with 7,12-dimethylbenz[*a*]anthracene by two exposure routes at different developmental stages. Toxicol. Pathol. 28:705-715.

Spitsbergen, J.M., Tsai, H., Reddy, A.R., Arbogast, D., Miller, T., Hendricks, J.D., and Bailey, G.S. 2000. Neoplasia in zebrafish treated with *N*-methyl-*N'*-nitro-*N*-nitrosoguanidine by three exposure routes at different developmental stages. Toxicol. Pathol. 28:716-725.

Spitsbergen, J.M., and M.J. Wolfe. 1995. The riddle of hepatic neoplasia in brown bullheads from relatively unpolluted waters in New York State. Toxicologic Pathology 23:716-725.

Spitsbergen, J.M., and M.J. Wolfe. 1995. Hepatocyte clusters in the spleen--a normal feature of some populations of brown bullheads in New York State. Toxicologic Pathology 23:726-730.

Spitsbergen, J.M., M.K. Walker, R.E. Peterson and J.R. Olson. 1991. Pathologic alterations in early life stages of lake trout exposed to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). Aquatic Toxicology 19:41-72.

Spitsbergen, J.M., J.M. Kleeman and R.E. Peterson. 1988. Morphologic lesions and acute toxicity in rainbow trout (*Salmo gairdneri*) treated with 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). Journal of Toxicology and Environmental Health 23:333-358.

Spitsbergen, J.M., J.M. Kleeman, K.A. Schat and R.E. Peterson. 1988. Effects of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) or Aroclor 1254 on the resistance of rainbow trout, *Salmo gairdneri* Richardson, to infectious hematopoietic necrosis virus. Journal of Fish Diseases 11:73-83.

Spitsbergen, J.M., J.M. Kleeman and R.E. Peterson. 1988. 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity in yellow perch *Perca flavescens*. Journal of Toxicology and Environmental Health 23:359-383.

Spitsbergen, J.M., and K.A. Schat. 1986. A chromium release assay for the assessment of spontaneous and immune hemolysis of erythrocytes by sera of rainbow trout. Developmental and Comparative Immunology 10:11-23.

Spitsbergen, J.M., K.A. Schat, J.M. Kleeman and R.E. Peterson. 1986. Interactions of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) with immune responses of rainbow trout. Veterinary Immunology and Immunopathology 12:263-280.

Coauthor Journal Articles/Book Chapters

Ju, B., Spitsbergen, J., Chen, W. 2008 submitted. Co-activation of Hedgehog and AKT pathways promotes tumorigenesis in zebrafish. Cancer Research.

Kent, M.L., Feist, S.W., Harper, C., Hoogstraten-Miller, S., Law, J.M., Sanchez-Morgado, J.M., Tanguay, R.L., Sanders, G.E., Spitsbergen, J.M., Whipps, C.M. 2008 in press. Recommendations for control of pathogens and infectious diseases in fish research facilities. Comparative Biochemistry and Physiology, Part C.

Lam, S.H., Winata, C.L., Tong, Y., Korzh, S, Lim, W.S., Korzh, V., Spitsbergen, J., Mathavan, S., Miller, L.D., Liu, E.D., and Gong, Z. 2006. Trancriptome Kinetics of Arsenic-induced Adaptive Response in Zebrafish Liver. Physiological Genomics 27(3): 351-61.

Lam, S.H., Wu, Y.L., Miller, L.D., Spitsbergen, J.M., Tong, Y., Lee, S., Mathavan, S., Vega, V.B., Liu, E., Buhler, D.R., Gong, Z. 2006. Conservation of gene expression signatures between zebrafish and human liver tumors and tumor progression. Nature Biotechnology 24: 73-5.

Shepard, J.L., Amatruda, J.F., Stern, H.M., Subramanian, A., Finkelstein, D., Ziai, J., Finley, K.R., Pfaff, K.L., Hershey, C., Zhou, Y., Barut, B., Freedman, M., Lee, C., Spitsbergen, J., Neuberg, D., Weber, G., Golub, T.R., Glickman, J.N., Kutok, J.L., Aster, J.C., Zon, L.I. 2005. A zebrafish *bmyb* mutation causes genomic instability and increased cancer susceptibility. Proceedings of the National Academy of Sciences. 102: 13194-13199.

Kent, M.L., Watral, V.G., Whipps, C.M., Cunningham, M.E., Criscione, C.D., Heidel, J.R., Curtis, L.R., Spitsbergen, J.M., Markle, D.F. 2004. A digenean metacercaria (*Apophallus sp.*) and myxozoan (*Myxobolus sp.)* associated with vertebral deformities in cyprinid fishes from the Willamette River, Oregon. J. Aquat. An. Health. 16: 116-129.

Andreasen, E.A., Spitsbergen, J.M., Tanguay, R.L., Heideman,W. and Peterson, R.E. 2002. Tissue-specific expression of AHR2, ARNT2, and CYP1A in zebrafish embryos and larvae: effects of developmental stage and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin exposure. Toxicol. Sci. 68: 403-419.

Kent, M., Bishop-Stewart, J., Matthews, J., Spitsbergen, J. 2002. *Pseudocapillaria tomentosa*, a pathogen of zebrafish (*Danio rerio*) held in research colonies. Comparative Pathol. 52: 354-358.

Dawe, C.J., Spitsbergen, J.M., Hendricks, J.D., Harshbarger, J.C., Kimura, I. and Khudoley, V.V. In press. Neoplasia of the alimentary canal. In *Pathobiology of spontaneous and induced neoplasms in fishes: Comparative characterization, nomenclature and literature.* (C.J. Dawe and J.C. Harshbarger, eds). Academic Press, New York, NY.

Carlson, D.B., Williams, D.E., Spitsbergen, J.M., Ross, P.F., Bacon, C.W., Meredith, F.I., and Riley, R.T. 2001. Fumonisin B_1 promotes aflatoxin B_1 and N-methyl-N'-nitro-N-nitrosoguanidine initiated liver tumors in rainbow trout. Toxicol. Appl. Pharmacol. 172 (1):29-36.

Riley, R.T., Enongene, E., Voss, K.A., Norred, W.P., Meredith, F.I., Sharma, R.P., Spitsbergen, J.,Williams, D.E., Carlson, D.B., Merrill, A.H. Jr. 2001. Sphingolipid perturbations as mechanisms for fumonisin carcinogenesis. Environ. Health Perspect. 109 Suppl 2:301-8.

Foster, E.P., Fitzpatrick, M.S., Feist, G.W., Schreck, C.B., Yates, J., Spitsbergen, J.M., Heidel, J. 2001. Plasma androgen correlation, EROD induction, reduced condition factor, and the occurrence of organochlorine pollutants in reproductively immature white sturgeon (*Acipenser transmontanus*) from the Columbia River, USA. Arch. Environ. Contam. Toxicol. 41:182-91.

Guiney, P.D., Walker, M.K., Spitsbergen, J.M. and Peterson, R.E. 2000. Hemodynamic dysfunction and cytochrome P450 mRNA expression induced by TCDD during embryonic stages of lake trout development. Toxicol. Appl. Pharmacol. 168:1-14.

Diawara, M.M., Williams, D.E., Oganesian, A. and Spitsbergen, J.M. 2000. Dietary psoralens

induce hepatotoxicity in C57 mice. Journal of Natural Toxins 9:179-195.

Reddy, A., Spitsbergen, J.M., Mathews, C., Hendricks,J.D. and Bailey, G.S. 1999. Hepatic tumorigenicity by dietary dibenzo[*a,l*]pyrene in medaka (*Oryzias latipes*). *J. Environ. Pathol. Toxicol.* 18(4):261-269.

Hornung, M.W., Spitsbergen, J.M. and Peterson, R.E. 1999. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin alters cardiovascular and craniofacial development and function in sac fry of rainbow trout (*Oncorhynchus mykiss*). Toxicol. Sci. 47:40-51.

Henry, T.R., Spitsbergen, J.M., Hornung, M.W., Abnet, C.C., and Peterson, R.E. 1997. Early life stage toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in zebrafish (*Danio rerio). Toxicol. Appl. Pharmacol.* 142:56-68.

Poulet, F.M. and J.M. Spitsbergen. 1996. Ultrastructural study of spontaneous orocutaneous neoplasms of brown bullheads (*Ictalurus nebulosus*). Diseases of Aquatic Organisms 24:93-98.

Fisher, J.P., J.M. Spitsbergen, T. Iamonte, E.E. Little, and A. DeLonay. 1995. Pathological and behavioral manifestations of the "Cayuga Syndrome", a thiamine deficiency in larval landlocked Atlantic salmon. Journal of Aquatic Animal Health 7:269-283.

Fisher, J.P., J.M. Spitsbergen, R. Getchell, J.Symula, J. Skea, M. Babenzein and T. Chiotti. 1995. Reproductive failure in landlocked Atlantic salmon from New York's Finger Lakes: investigations into the etiology and epidemiology of the "Cayuga Syndrome". Journal of Aquatic Animal Health 7:81-94.

Fisher, J.P., Fitzsimons, J.D., Combs, G.F. and J.M. Spitsbergen. 1995. Naturally occurring thiamine deficiency causing reproductive failure in Finger Lakes Atlantic salmon. Trans. Am. Fish. Soc. 125: 167-178.

Fisher, J.P., J.M. Spitsbergen and B. Jahan-Parwar. 1994. Effects of embryonic PCB exposure on hatching success, survival, growth and developmental behavior in landlocked Atlantic salmon, *Salmo salar*. In: Environmental toxicology and risk assessment, 2nd Vol. ASTM STP 1173, eds. J.W. Gorsuch, F.J. Dwyer, C.G. Ingersoll and T.W. La Point, American Society for Testing and Materials, Philadelphia, PA. p. 298-314.

Poulet, F.M., M.J. Wolfe and J.M. Spitsbergen. 1994. Naturally occurring orocutaneous papillomas and carcinomas of brown bullheads (*Ictalurus nebulosus*) in New York State. Veterinary Pathology 31:8-18.

Poulet, F.M., Casey, J.W. and J.M. Spitsbergen. 1993. Studies on transmissibility and etiology of orocutaneous tumors of brown bullheads (*Ictalurus nebulosus*). Diseases of Aquatic Organisms 16:97-104.

Cheng, Li-Lin, P.R. Bowser and J.M. Spitsbergen. 1993. Development of cell cultures derived from lake trout liver and kidney in a hormone-supplemented, serum-reduced medium. Journal of Aquatic Animal Health 5:119-126.

Walker, M.K., J.M. Spitsbergen, J.R. Olson and R.E. Peterson. 1991. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity during early life stage development of lake trout (*Salvelinus namaycush*). Canadian Journal of Fisheries and Aquatic Sciences 48:875-883.

Final Reports to Grant Agencies

Spitsbergen, J.M. 1995. Cardiovascular toxicity of environmental contaminants to developing fish--molecular mechanisms. NTIS-AD-A305 805/4. Final Technical Report. U.S. Air Force, Bolling Air Force Base, D.C.

Spitsbergen, J.M. 1993. Presque Isle Bay Brown Bullhead Tumor Study. Final Report to Pennsylvania Department of Environmental Protection, Meadville, PA.

Spitsbergen, J.M. 1994. Final Report on Neoplasia and Other Lesions in Fish from the Oswego Harbor Area of Concern. New York State Department of Environmental Conservation, Albany, NY.

Spitsbergen, J.M. and P.R. Bowser. 1990. Development of lake trout cell lines for virology research. Final Report to Great Lakes Fishery Commission.

Meeting Abstracts

Spitsbergen, J.M., Norred, E.R., Zhan, H., Gong, Z., Lo, L.C., Johnson, N.J., Banks, H.K. 2008. The Role of Inflammation in Intestinal and Blood Neoplasia in Zebrafish. Zebrafish Development and Genetics Meeting, Madison, WI.

Ju, B., Spitsbergen, J., Chen, W. 2008. Co-activation of Hedgehog and AKT pathways promotes tumorigenesis in zebrafish. Zebrafish Development and Genetics Meeting, Madison, WI.

Heiden, T.K., Spitsbergen, J.M., Xiong,K., Heideman, W., Peterson, R.E. 2008. Sublethal TCDD exposure during early stages of development induces craniofacial, cardiac and reproductive toxicity in adult zebrafish. . Zebrafish Development and Genetics Meeting, Madison, WI.

Spitsbergen, J.M.,Norred, E.R., Lo, L.C., Johnson, N.J. 2008. The role of inflammation in the pathogenesis of myelodysplastic syndrome and leukemia in mutant lines of zebrafish. Fourth Aquatic Animal Models of Human Disease Conference, Durham, NC.

King Heiden, T.C., Spitsbergen, J.M., Heideman, W., Peterson, R.E. 2007. Early life stage dioxin exposure alters craniofacial development, induces cardiac toxicity, and impairs

reproductive capability of adult zebrafish. Future Research on Endocrine Disruption: Translation of Basic and Animal Research to Understand Human Disease, Sponsored by the National Institutes of Environmental Health Sciences, Durham, NC.

King Heiden, T.C., Spitsbergen, J.M., Heideman, W., Peterson, R.E. 2007. Exposure to TCDD during embryonic development and gonad differentiation impairs reproductive capacity of zebrafish. Annual Meeting Society of Environmental Toxicology and Chemistry, Milwaukee, WI.

Spitsbergen, J.M., Norred, R., Taylor, A., Buhler, D.R. 2006. Lines of Zebrafish with Mutations in the *uma* Gene and in the Delta-Notch Signaling Pathway Show Elevated Incidences of Ultimobranchial Neoplasia Following Fry Immersion Treatment with the Polycyclic Aromatic Hydrocarbon Carcinogen 7,12-Dimethlybenz[*a*]anthracene (DMBA). Zebrafish Development and Genetics Meeting, Madison, WI.

Spitsbergen, J.M., Kent, M.L., Westerfield, M. 2005. Diet and husbandry system strongly influence tumor incidences in zebrafish of the AB line at two years of age. Aquatic Animal Models of Human Disease, Athens, GA.

Wang-Buhler, J., Chung, W., Tseng, H., Miranda, C., Hu, C., Hseu, T., Taylor, A., Spitsbergen, J.M., Buhler, D.R. 2005. Development of specific antipeptide antibodies against zebrafish xenobiotic metabolising forms of cytochrome P450. Society of Toxicology, New Orleans, LA.

Spitsbergen, J.M., Buhler, D.R., Miller, T. 2004. *Another long fin* and *uma* mutant lines are highly sensitive to polycyclic aromatic hydrocarbon-induced liver neoplasia. Zebrafish Development and Genetics Meeting, Madison, WI.

Lam, S.H., Mathavan, S., Tong, Y., Hu, J., Winata, C.L., Xu, X., Wu, Y.L., Spitsbergen, J., Miller, L.D., Liu, E. Gong, Z. 2004. Of fish and chips: genome-wide expression profiling studies using a zebrafish DNA chip. Zebrafish Development and Genetics Meeting, Madison, WI.

Bailey, G.S., Pratt, M.M., Pereira, C.B., Hendricks, J.D., Spitsbergen, J.M., Williams, D.E. 2003. Potential of the rainbow trout tumor model in cancer risk assessment. Aquatic Animal Models of Human Disease Conference, Manassas, VA.

Fournie, J.W., Hawkins, W.E., Vogelbein, W.K., Spitsbergen, J.M. 2003. Small fish species as models for exocrine pancreatic carcinogenesis. Aquatic Animal Models of Human Disease Conference, Manassas, VA.

Spitsbergen, J.M., Kent, M.L., Bishop-Stewart, J.K., Miller, T., Matthews, J.L., Buhler, D.R. 2002. Spontaneous and carcinogen-induced neoplasia and other lesions in wild-type and mutant lines of zebrafish. Zebrafish Development and Genetics Meeting, Madison, WI.

Jennifer L. Matthews, J.L., Spitsbergen, J., Bishop-Stewart, J., Westerfield, M., Kent, M.L. 2002.

A summary of common diseases of laboratory zebrafish. Zebrafish Development and Genetics Meeting, Madison, WI.

Spitsbergen, J.M. 2002.The state of the art of the zebrafish model for toxicology and toxicologic pathology research—advantages and current limitations. Society of Toxicologic Pathology, 21st Annual Symposium—Non-Rodent Species in Toxicologic Pathology, Denver, CO.

Bishop-Stewart, J.K., Matthews, J.L. Larison, K., Spitsbergen, J., Westerfield, M., Kent, M.L. 2001. Diseases of Zebrafish in Research Facilities. Fish Health Section of American Fisheries Society. Victoria, British Columbia.

Beckwith, L.G., Moore, J.L. Tsao-Wu, G.S., Spitsbergen, J.M., Hendricks, J.D., Harshbarger J.C., Cheng, K.C. 2000. Induced and spontaneous neoplasia in zebrafish (*Danio rerio*). Cold Spring Harbor Zebrafish Development and Genetics Meeting.

Reddy, A., Spitsbergen, J.M., Hendricks, J. And Bailey, G. 1999. An $ED_{0.1}$ dose-response tumor study of the environmental carcinogen dibenzo[*a,l*]pyrene (DB[*a,l*]P) in rainbow trout. Proc. Am. Assoc. Cancer Res. 40:405.

Spitsbergen, J.M., Tsai, H., Reddy, A. and Hendricks, J. 1997. Response of zebrafish to a panel of structurally diverse carcinogens. *Proc. AACR* 38, 354.

Oganesian, A., Siddens, L.K., Spitsbergen, J.M. and Williams, D.E. 1996. Induction of CYP1A1 in rat and rainbow trout liver slices using 12-well plates and the shaker system of incubation. Congress on In Vitro Biology, San Francisco.

Fisher, J.P., J.M. Spitsbergen, G.F. Combs, M. Babenzein and T. Chiotti. 1994. Reproductive failure in wild-caught Atlantic salmon *Salmo salar* from New York's Finger Lakes: Epizootiology of the Cayuga Syndrome. International Symposium on Aquatic Animal Health, Seattle, WA.

Fisher, J.P., J.M. Spitsbergen, T. Iamonte and B. Bush. 1994. Structure/activity neurotoxicity of PCBs to early-life-stages of the Atlantic salmon and rainbow trout: an ethological model. 18th Annual Larval Fish Conference, St. Andrews, New Brunswick.

Fisher, J.P., J.M. Spitsbergen, T. Reimers, S. Lamb, M. Babenzein and T. Chiotti. 1994. Epizootiology of the 'Cayuga Syndrome', a lethal condition of larval landlocked Atlantic salmon in New York's Finger Lakes. International Association for Great Lakes Research, Windsor, Ontario.

Fisher, J.P., J.M. Spitsbergen and B. Jahan-Parwar. 1992. Effects of embryonic PCB exposure on neurobehavioral development and growth in Atlantic salmon. Second Symposium on Environmental Toxicology and Risk Assessment. American Society for Testing and Materials, Philadelphia, PA.

Fisher, J.P., J.M. Spitsbergen, D.E. Rosen and B. Jahan-Parwar. 1990. Effects of embryonic PCB burdens on hatchability, survival, growth and developmental behavior in landlocked Atlantic salmon *Salmo salar*. Soc. Environ. Toxicol. Chem. 11th Ann. Mtg. Abstr.

Fisher, J.P. and J.M. Spitsbergen. 1990. Early life stage mortality syndrome in Cayuga Lake landlocked salmon. Roundtable on Contaminant-Caused Reproductive Problems in Salmonids, Windsor, Ontario.

Spitsbergen, J.M., P.R. Bowser and M.J. Wolfe. 1989. Epizootic neoplasia of the lateral line system of lake trout in New York's Finger Lakes. Fish Health Section of American Fisheries Society/Eastern Fish Health Workshop.

Spitsbergen, J.M., M.K. Walker, R.E. Peterson and J.R. Olson. 1988. Pathologic lesions in early life stages of lake trout exposed to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Soc. Environ. Toxicol. Chem. 9th Ann. Mtg. Abstr.

Spitsbergen, J.M., and K.R. Cooper. 1988. Effects of various pharmacologic agents on the toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) to the medaka embryo. New Jersey Department of Environmental Protection/Environmental and Occupational Health Sciences Institute Annual Meeting, Trenton, NJ.

Spitsbergen, J.M., J.M. Kleeman and R.E. Peterson. 1984. Toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) in freshwater fish. Toxicologist 4:190.

Carlisle, J.C. and J. Spitsbergen. 1980. Bacterial kidney disease of rainbow trout in sea water. Biological Bulletin 159:495-496.

EXTENSION ACTIVITIES/PUBLIC SERVICE

April 2008. Presented lectures regarding noninfectious diseases and complicating factors regarding the use of zebrafish in research to laboratory animal veterinarians at C.L. Davis Foundation Symposium on Zebrafish Management, Welfare and Medicine at Myrtle Beach, South Carolina.

Sept 2007. Together with Dr. Paul Bowser of Cornell University and Dr. Michael Kent of Oregon State University presented a 5-day short course on fish health management and fish disease control in a research setting for students from around the world at Mount Desert Biological Laboratory, Salisbury Cove, Maine.

July 2007. Presented lectures regarding phenotyping and pathology of mutant lines of zebrafish at the C.L. Davis Foundation Symposium on Pathology of Genetically Engineered Rodents and Aquatic Species, Madison, WI.

Nov 2006. Lectured on zebrafish neoplasia and the promise of the zebrafish model for

anticancer drug discovery in the Department of Biological Sciences, National University of Singapore. Presented a workshop regarding anatomy, histology, neoplasia, and health management of zebrafish to graduate students, post-doctoral fellows, and faculty in the the Department of Biological Sciences, National University of Singapore.

June 2006. Lectured on zebrafish neoplasia and the promise of the zebrafish model for anticancer drug discovery at the biotechnology company Znomics in Portland, OR. Presented a workshop regarding neoplasia in zebrafish to graduate students and post-doctoral fellows in the laboratory of Dr. Wenbiao Chen at the Vollum Institute of Oregon Health and Science University, Portland, OR

May 2006. Lectured on zebrafish neoplasia and discussed research collaboration with Drs. Istvan Magyary and George Szekeres at the University of Kaposvar, Faculty of Animal Science in Hungary. Lectured on zebrafish diseases for veterinary students and graduate students in fish diseases at Szent Istvan University, Budapest, Hungary.

Sept. 2005. Together with Dr. Paul Bowser of Cornell University and Dr. Michael Kent of Oregon State University presented a 5-day short course on fish health management and fish disease control in a research setting for 22 students from around the world at Mount Desert Biological Laboratory, Salisbury Cove, Maine.

May 2005. Participated as a reviewer of proposals submitted to the Science and Technology Center in Ukraine, whose main objective is to refocus weapons scientists on non-weapons research.

Dec. 2004. Together with Dr. Paul Bowser of Cornell University presented a 3-day short course on fish health management and fish disease control in a research setting for staff at Mount Desert Biological Laboratory, Salisbury Cove, Maine.

June 2004. Participated in advisory committee to Marine and Freshwater Biomedical Sciences Center at Mount Desert Biological Laboratory, Salisbury Cove, Maine, to help optimize animal husbandry facilities and protocols and ensure optimal health of animals used in research.

Oct. 2003. Submitted cases of esthesioneuroepithelioma and esthesioneuroblastoma in zebrafish and cases of nephroblastoma in rainbow trout to the Registry of Toxicologic Pathology for Animals for use in the Toxicologic Histopathology Web Slide Conference.

2003-2004. Member of Advisory Committee on the Web-Based Registry for Toxicologic Pathology, Society of Toxicologic Pathology.

June 2002. Invited speaker at Society of Toxicologic Pathology, 21st Annual Symposium—Non-Rodent Species in Toxicologic Pathology, Denver, CO. Presented lecture titled, "The state of the art of the zebrafish model for toxicology and toxicologic pathology research—advantages and current limitations."

Feb. 2001. Invited speaker at Pathology of Mutant Animal Models 2001, Baylor College of Medicine, Houston, TX. Presented lecture titled, "Mutant fish models for understanding mechanisms in vertebrate development and disease".

May 2001. Participated in career day at North Albany Middle School. Discussed posters illustrating the variety of career options for veterinarians today. One poster illustrated use of fish models for cancer research at the Food Toxicology and Nutrition Lab at OSU.

June 2000. Participated in scientific advisory board meeting in Tuxedo, NY for the Hudson River Foundation, helping to evaluate chronic adverse effects of environmental contaminants such as PCBs on fish health in the lower Hudson River. Have continued to review grant proposals to the Hudson River Foundation following the meeting.

Aug. 1997-Jan. 1999. Conducted literature review and developed feasibility and cost estimates for use of small aquarium fish to evaluate human health risks associated with drinking water produced by ground water recharge of wastewater in Orange County, CA.

Oct. 9 1997. Hosted tour of Fish Carcinogenesis and Histopathology Laboratory at Oregon State University for freshman engineering students.

Sept. 1995-June 1999. Hosted several tours of Fish Carcinogenesis and Histopathology Laboratory at Oregon State University for high school classes.

June 16-17 1997. Presented poster outlining the mission and activities of Oregon State University's Marine/Freshwater Biomedical Sciences Center at NIEHS Community Outreach and Education symposium, Research Triangle Park, NC.

June 2 1997. Presented poster: "Response of zebrafish to a panel of structurally diverse carcinogens" at poster session for NIEHS Center Directors' Meeting, Lincoln City, OR.

May 23 1994. Presented invited lecture, "The Challenges Involved in Conducting Epidemiologic Studies in Feral Fish", at C.L. Davis Symposium on Wild Species Pathology held at the Virginia-Maryland Regional college of Veterinary Medicine, Blacksburg, VA.

June 30 1992. Presented afternoon program on Aquatic Animal Medicine to 4H teens as part of the College of Veterinary Medicine's program to introduce youth to diverse veterinary careers.

April 3 1992. Presented a poster regarding activities of the Fish Pathology Laboratory at poster session of members of the new Center for the Environment at Cornell University, Ithaca, NY.

Feb. 16 1992. Presented information on fish health management at aquaculture workshop at SUNY Cobleskill, NY.

Mar. 26, 1992. Presented Fish Health Workshop for DEC biologists at Thornfield Center, Cazenovia, NY.

Nov. 11 1991. Presented guest lectures on finfish pathology and neoplasia to veterinary students at University of Pennsylvania, Philadelphia.

June 3 1991. Presented lecture regarding finfish neoplasia to veterinary pathologists at 15th Annual Symposium on Veterinary and Comparative Pathology (sponsored by C.L. Davis Foundation), Woods Hole, MA.

Jan. 18-19 1991. Chaired session on New Techniques in Great Lakes Toxicology. Great Lakes Research Consortium Student-Faculty Conference, Syracuse, NY.

An *ad hoc* reviewer for the journals Canadian Journal of Fisheries and Aquatic Sciences, Environmental Toxicology and Chemistry, Journal of Aquatic Animal Health, Diseases of Aquatic Organisms, Aquatic Toxicology, Transactions of the American Fisheries Society, Aquaculture, Toxicologic Pathology, Veterinary Pathology, Environmental Health Perspectives, Toxicology and Applied Pharmacology, Toxicological Sciences and Toxicology Letters, Environmental and Molecular Mutagenesis, Expert Opinion on Drug Discovery, Biology and Molecular Biology of Fishes edited by P.W. Hochachka and T.P. Mommsen.

External Assessor reviewing grant proposals to Research Grants Council, Hong Kong, China, 2005.

External Reviewer of Pilot Project Grants for Marine and Freshwater Biomedical Sciences Center, University of Wisconsin, Milwaukee, 2002.

Reviewer of Grant Proposals to Hudson River Foundation, 2001.

Assisted in proposal evaluation process for NOAA Saltonstall-Kennedy Program, 1997.

External Assessor reviewing grant proposals to University and Polytechnic Grants Committee, Hong Kong. 1994.

Reviewed Dr. Hugh Ferguson's book Systemic Pathology of Fish for the Journal of the American Veterinary Medical Association, Sept., 1989.

EXTRAMURAL AND INTRAMURAL FUNDING FOR RESEARCH, SERVICE AND TEACHING

Current Funding

1. Mutant Lines of Zebrafish Highly Sensitive to Neoplasia. NIEHS. (J. Spitsbergen, PI, J. Postlethwait, collaborator). R21 Exploratory Research Proposal. 1R21ESO13124-01A1.

8/1/04-4/30/08. No cost extension 4/30/06-4/31/08. Annual Direct Costs: $100,000; 15% effort of Dr. Spitsbergen

This project will: 1)screen mutagenized zebrafish for inactivating mutations of zebrafish homologs of human tumor suppressor genes; 2)evaluate responsiveness of mutant lines of zebafish to the carcinogens MNNG and DMBA in order to establish lines of zebrafish rapidly developing high incidences of specific histologic types of neoplasia.

2. Zebrafish Carcinogenesis and Cytochrome P450 Expression. NCI, 1R01ES011587- 01 (PA-98-074—The Zebrafish as an Animal Model...) (D. Buhler, PI, J Spitsbergen, coinvestigator). 7/01/01-6/30/06. No cost extension 6/30/06-5/31/07. Annual Direct Costs: $200,000; 10% effort of Dr. Spitsbergen.

This project will: 1)identify carcinogen sensitive zebrafish lines by comparing the responsiveness of selected wild-type and mutant lines to the carcinogens aflatoxin B1 and dibenzo[*a,l*]pyrene; 2)clone and sequence new cytochrome P450 (CYP) enzymes relevant to carcinogen metabolism; 3)map the genes coding for newly identified CYP enzymes in collaboration with scientists at University of Oregon; 4)will characterize tissue-, cell- and sex-specific expression patterns for these CYP enzymes in zebrafish embryos, fry and adults using RT-PCR, Western blotting, immunohistochemistry and *in situ* hybridization techniques.

3. Biomedical Research Council of Singapore, "Molecular Mechanisms of Liver Development and Heptocarcinogenesis: the Zebrafish Model. (Zhiyuan Gong, PI, J. Spitsbergen collaborator)

This project will 1)investigate molecular mechanisms of liver development and liver cancers with respect to human medicine; 2)develop genomic tools by generation of >30,000 EST/full length cDNA sequences and by production of zebrafish DNA chips using 60mer oligonucleotides representing unigenes or singltons; 3) identify novel zebrafish genes involved in liver carcinogenesis and development by expression profile analyses using EST and microarray approaches; 4)investigate the function of candidate tumor suppressor genes and oncogenes orthologous to human genes involved in liver development and cancer; 5) study liver development in both wild type and mutant embryos by establishment of a liver-GFP transgenic model, identification of growth factors and transcription factors important in liver development, and screening of small molecules capable of modulation of liver development.

4. "Latent Toxicity in Adult Zebrafish Following Early Life Stage Exposure to 2,3,7,8-Tetrachlorodibenzo-p-dioxin". Wisconsin Sea Grant (R.E. Peterson, PI, J. Spitsbergen, collaborator). 3/1/06-2/28/09. J. Spitsbergen, 10% effort.

This grant will:
Determine if exposure of zebrafish to a sublethal concentration of waterborne TCDD during early development and gonad differentiation disrupts development, causes organ pathology, impairs feeding, reduces body growth and/or interferes with male or female reproductive capability.

Pending Funding

1. 1 R01 HD053296-01. Dual assignment to several Institutes at NIH during review. "Development and Application of a Zebrafish Intestinal Cancer Research Model" (J. Spitsbergen PI, M. Kent coinvestigator). 50% effort of Dr. Spitsbergen, 9% effort of Dr. Kent. $225,000 Annual Direct Costs.

This grant will:
1)develop experimental protocols to reliably induce high incidences and multiplicities of intestinal neoplasia in zebrafish using regimens of carcinogen treatment combined with infection of fish by the intestinal nematode *Pseudocapillaria tomentosa*. 2)conduct range-finding assays to determine maximum tolerated doses of the carcinogens azoxymethane (AOM) and 2-amino-1-methyl-6-pheny-imidazo[4,5-*b*] pyridine (PhIP) in 3 lines of zebrafish, TU X AB, *another long fin* (*alf*^{ty86d}), and *uma*^{s2068}. 3) quantitate aberrant intestinal folds (AIF), the zebrafish equivalent of aberrant crypt foci in mammals, using methylene blue stain and stereomicroscopic examination of intestinal tracts at the various sampling time points. 4)assess markers of oxidant damage to intestinal tissue, malondialdyhyde and nitrotyrosine, in regions with normal, hyperplastic, dysplastic and neoplastic mucosal epithelium in fish exposed to combinations of carcinogen and nematodes or to carcinogen or nematodes alone. In these fish we will utilize immunohistochemistry to quantify cell proliferation in normal and abnormal epithelium of the intestinal mucosa with the marker proliferating cell nuclear antigen (PCNA). 5) utilize laser capture microdissection to collect tissue from hyperplastic, dysplastic, adenomatous and carcinomatous intestinal lesions. Using oligonucleotide microarrays we will compare gene expression and gene copy number in these lesions with normal looking tissue from the same intestinal tracts and normal tissue from control fish. We will utilize immunohistochemistry to assess the location and intensity of protein expression for the *ras* and *beta-catenin* (*ctnnb*) oncogenes and the *adenomatous polyposis coli* (*apc*) tumor suppressor gene in various histologic lesions and in normal intestinal tissue. We will look for mutations in regions of the *nras* and *cttnb* genes that are most prone to mutation in intestinal neoplasia of mammals.

2. 1R03ES014867-01. NIEHS. "Evaluation of Cyprinid Herpesvirus 1 (CyHV-1) for Oncogenicity in Zebrafish". (J. Spitsbergen, PI, M. Kent coinvestigator). 25% effort J. Spitsbergen; 5% effort M. Kent. $50,000 Annual Direct Costs.

This grant will:
1)determine whether cyprinid herpesvirus 1 (CyHV-1), the cause of orocutaneous papillomas in carp, can infect zebrafish cell cultures or zebrafish of various ages. 2) challenge zebrafish fry, juveniles and adults held at 3 water temperatures (20, 25, and 27 C) by immersion exposure to CyHV-1, and will observe the fish during the following year for possible neoplasm development. 3) look for evidence of viral infection of zebrafish following challenge by attempting virus isolation in zebrafish cell cultures and by examining zebrafish tissues histologically.

3. "A Zebrafish Model for Fanconi Anemia" NIH, National Heart, Blood and Lung Institute. (J. Postlethwait PI, J. Spitsbergen coinvestigator). J. Spitsbergen 20% effort.

This grant will:
1)characterize the developmental effects of inactivation of Fanconi anemia genes in zebrafish early life stages by the use of morpholino antisense oligonucleotides and inactivating gene mutations. 2) evaluate the incidence and histologic types of neoplasia occurring in zebrafish models of Fanconi anemia and compare those parameters to neoplasia occurring in wild-type zebrafish of the same genetic background.

4. "Use of Histopathology in Assessment of Toxicity using Zebrafish Early Life Stages". SBIR, NIH (Rashi Gautam of Zygogen, Atlanta GA PI, J. Spitsbergen consultant).

5."Inflammatory mediators and hematologic disorders in zebrafish models for Fanconi anemia". R21, NIH, National Institute of Diabetes, Digestive, and Kidney Diseases. (J. Spitsbergen PI, 50% effort). $125,000-150,000 Annual Direct Costs.
This grant will:
1)optimize protocols for inducing inflammatory mediators in zebrafish. 2)determine whether repeated exposure to spikes of inflammatory mediators early in life will accelerate the development of hemopoietic abnormalities in zebrafish models of Fanconi anemia 3)utilize microarray analysis of gene expression to characterize the pathogenesis of hemopoietic disorders in zebrafish Fanconi anemia models exposed to spikes of inflammatory mediators.

6."Translatable Tumor Model in Clonal Zebrafish—a Novel Tool in Cancer Research". R01, NIH, Transinstitute Zebrafish Initiative (Revskoy, S., PI, University of Chicago); J. Spitsbergen coinvestigator, 10% effort). This grant will 1) establish a novel model of hepatic tumors with a defined mechanism of induction; 2) Generate diverse transplantable tumor lines from chemically-induced tumors.

7. "A System for Discovering and Validating Cancer Genes in Zebrafish", R01, National Cancer Institute, NIH (Chen, W. PI, Oregon Health and Science University, Portland OR; J. Spitsbergen co-PI, 10% effort) This grant will 1)develop and characterize transgenic lines of zebrafish for study of genetics, enhancers and suppressors of melanoma and basal cell carcinoma of skin; 2)determine whether $KiRAS^{G12V}$ and *GLI1* are essential for maintenance of melanomas and basal cell carcinomas induced by these two genes, respectively.

8. "Zebrafish as a Chemoprevention and Drug Discovery Model System Using Dog Tumor Xenografts", Morris Animal Foundation Canine Cancer Initiative" (J.Spitsbergen, PI, 50% effort; S. Helfand Co-I). This grant proposes to 1)Optimize protocols for study of canine hemangiosarcoma (HSA) xenografts into xenografts into zebrafish embryos, juveniles, and adults. 2) Characterize the extent of local invasion and possible metastasis of canine HSA xenografts in zebrafish embryos, juveniles, and adults. 3)Validate that treatment regimens showing a beneficial effect against canine HSA or human vascular neoplasm xenografts into immunocompromised mice or in cancer patients are effective in suppressing tumor growth,

invasion, and/or metastasis of canine HSA xenografts in zebrafish. 4)Screen promising chemopreventive agents and new therapeutics for canine HSA for positive effects against canine HSA xenografts in zebrafish. 5) Test feasibility of establishing "caninized" immune systems in zebrafish when canine bone marrow is administered to immunologically immature embryos or to lethally irradiated juvenile or adult zebrafish. 6)Validate that immune enhancement with mediators effective in treatment of canine HSA xenografts in immunodeficient mice or in patients with vascular tumors are effective in the treatment of canine HSA xenografts in "caninized" zebrafish. 7)Evaluate treatment protocols combining initial treatment with traditional cancer chemotherapy drugs such as doxorubicin, cyclophosphamide and/or vincrisitine, followed by an immunomodulatory treatment such as (interleukin-12) IL-12 in treatment of canine HSA xenografts in "caninized" zebrafish.

9. "Humanizing Zebrafish—Pushing the Envelope", DP1, NIH Director's Pioneer Program (J. Spitsbergen, PI, 70%) 9/30/2008-7/31/2013, Estimated Annual Direct Costs $500,000

This project will 1)determine the feasibility of humanizing the immune system of zebrafish by creating stable chimeras with human immune cells xenografted into zebrafish. 2)determine the feasibility of creating stable chimeras with human tissues including skin, pigment cells, prostate, mammary, and lung xenografted into zebrafish. 3)Utilize these humanized zebrafish for mechanistic carcinogenesis studies, for chemoprevention and chemotherapy studies, and for drug discovery.

Previous Funding

Supplement to National Resource for Zebrafish (M. Westerfield, PI). NCRR, NIH, 3P40RR12546-03S1. 5/01/01- 4/30/05. Annual Direct Costs: $62,000-75,000; 75% effort of Dr. Spitsbergen. This supplement to the Zebrafish Resource Center: 1) evaluated the spontaneous rates of neoplasia in wild-type and mutant lines of zebrafish; 2) investigated the relative roles of diet, husbandry systems, infectious agents, and genetic influences on rates of spontaneous neoplasia in various lines of zebrafish.

Evaluation of Carcinogen-Induced Neoplasia in Mutant and Wild-Type Lines of Zebrafish. NIEHS, Pilot Project funded by Marine/Freshwater Biomedical Sciences Center at OSU. 8/1/00-7/31/02. Total Direct Costs: $15,000. J. M. Spitsbergen PI, M. Kent Coinvestigator. This pilot project: 1) conducted range-finding studies to define maximal tolerated doses of the carcinogens MNNG and DMBA in wild-type and mutant lines of zebrafish; 2) compared carcinogen responsiveness of mutant lines showing congenital tissue overgrowth, *longfin* (*lof*), *another longfin* (*alf*) and *knorrig* (*koi*), with wild-type zebrafish of AB and Tubingen lines.

Feasibility of Use of Small Aquarium Fish for Assessment of Human Health Risks from Wastewater Recharge of Aquifers Supplying Drinking Water to Orange, County, CA. Orange County Water District. 8/1/97-1/30/99. Total Direct Costs $20,000. J.M. Spitsbergen and G. Orner co-P.I.s.

NIEHS/NIH, PO1 (ES 04766--Program Project) "Rainbow Trout: A Model for Environmental Carcinogenesis" (George Bailey PI; 85% effort of Jan Spitsbergen as fish pathologist); 6/10/94-4/30/99

Major goals of this project: 1) to establish the shape of the dose-response for dietary dibenzo[*a,l*]pyrene particularly in the low dose range, to achieve 1/1000 rate of neoplasia. 2)To evaluate the role of selected oncogenes and tumor suppressor genes in the carcinogenesis process in rainbow trout.

Dr. Spitsbergen was responsible for the histopathologic assessment of trout from a 40,000 fish experiment. She supervised optimization of immunohistochemical assays to assess cell proliferation and cell death in liver and stomach from this large-scale carcinogenesis study.

NIEHS, NIH, P30 (ES03850) Marine/Freshwater Biomedical Sciences Center (G. Bailey, PI (1994-2004); D. Williams PI (2004-2009); J. Spitsbergen, Center Investigator, (15% effort 9/1/95-4/1/99); 4/1/94-3/31/09

This Center provides: 1) partial support for the Food Toxicology and Nutrition Laboratory; 2) enrichment programs and technical and administrative services towards the development and application of model aquatic species for basic mechanistic biomedical research.

Dr. Spitsbergen completed histologic study of zebrafish from carcinogenesis studies and prepared publications reporting findings of these zebrafish carcinogenesis studies. She conducted histopathologic assessment of rainbow trout from carcinogenesis studies testing initiation/promotion capability of fumonisin B together with aflatoxin B, and MNNG. She conducted histologic assessment of rainbow trout tissues from factorial experiments investigating tumor inhibition or promotion by indole-3-carbinol in carcinogenesis studies using DMBA.

NIEHS, NIH, R21/R33-ES-11267, Comparative Toxicogenomics Database (J. Boyer, PI, J. Spitsbergen, Participating Investigator); 7/1/01-6/30/03

This project: 1)establishes a comparative toxicogenomics database using selected DNA sequences of toxicological interest from 5 Marine/Freshwater Biomedical Sciences Centers and other participants; 2)provides sequencing services to Marine/Freshwater Centers to augment sequences in the database; 3)organizes toxicogenomics bioinformatics conferences for participants to review database development and progression to the R33 phase.

Cardiovascular Toxicity of Environmental Contaminants to Developing Fish--Molecular Mechanisms. Air Force Office of Scientific Research. 10/1/94-9/31/97. Total Direct Costs $135,000. J.M. Spitsbergen P.I.

Cooperative Investigation of Fish Lesions in Oswego Harbor Area of Concern. New York State Department of Environmental Conservation. 4/1/93-3/31/95. Total Direct Costs $63,900. J.M. Spitsbergen P.I.

Cooperative Investigation of Fish Pathology. New York State Department of Environmental Conservation. 4/1/88-3/31/93. Total Direct Costs $442,000. J.M. Spitsbergen P.I.

Cooperative Study of Epizootic Neoplasia of Brown Bullheads in Presque Isle Bay, Lake Erie.

Great Lakes Protection Fund through the Pennsylvania Department of Environmental Protection. 7/1/92-6/30/93. Total Direct Costs $8,000. J.M. Spitsbergen P.I.

Structure-Activity Effects of PCBs on Neurobehavioral Ontogeny of Atlantic Salmon. International Association for Great Lakes Research (IAGLR). 8/1/92-8/1/93. Ph.D. candidate Jeff Fisher P.I. $17,000 graduate student stipend.

Development of Interactive Computer Program to Teach Fish Health. Cornell Alumni Unrestricted Funds. 5/31/91-6/30/92. Total Direct Costs $5,000. J.M. Spitsbergen P.I.

Neurobehavioral Toxicology of Great Lakes Xenobiotics. Great Lakes Research Consortium. 9/1/89-9/1/90. Total Direct Costs $17,000. B. Jahan-Parwar P.I., J.M. Spitsbergen Co-investigator.

Preparation of a Guide to Identification of Common Parasites and Diseases in New York's Fishes. Sea Grant. 1992. Total Direct Costs $2,500. R.G. Getchell P.I., J.M. Spitsbergen Co-investigator.

Development of Lake Trout Cell Lines for Virology Research. Great Lakes Fish Commission. 1/1/89-12/31/89. Total Direct Costs $12,200. J.M. Spitsbergen P.I., P.R. Bowser Co-investigator.

Etiology of Orocutaneous Papillomas of Brown Bullheads. USDA through Cornell Consolidated Grant Program. 1/1/89-9/30/89. Total Direct Costs $13,900. J.M. Spitsbergen P.I.

Interaction of Polychlorinated Biphenyls and 2,3,7,8 Tetrachlorodibenzo-p-dioxin with the Resistance of Rainbow Trout to Viral Diseases. New York Sea Grant Institute. 1/1/83-12/31/85. Total Direct Costs $36,600. K.A. Schat P.I., J.M. Spitsbergen Co-investigator. (J.Spitsbergen wrote grant proposal.)

TEACHING, ADVISING AND VISITING SCIENTISTS HOSTED

Graduate Teaching and Mentoring

At the University of Oregon, served on graduate committee (2006-present) for Ph.D. candidate Hao Song whose thesis regards study of zebrafish models for Fanconi anemia.

At Oregon State University, served on graduate committee (1999-2001) for Ph.D. candidate Bryan Ford whose thesis focused on studies of the p53 tumor suppressor gene of rainbow trout.

At Oregon State University, in 1996, served as mentor for Ph.D. candidate in fish microbiology Tim Miller-Morgan for two terms of one-on-one tutorial study in fish histopathology.

Member of Graduate Faculty in Environmental Toxicology at Cornell University 1989-1995.

At Cornell University, served as Chair of Special Committees in the Field of Environmental Toxicology for Dr. Frederique Poulet who completed Ph.D. in the spring of 1994 and for Dr. Jeff Fisher who completed Ph.D. in Jan. 1995.

At Cornell University, served as Minor Member of Special Committee for Dr. Dana Stoffregen, Ph.D. candidate in the Field of Veterinary Medicine, with a minor in Environmental Toxicology, who completed his Ph.D. in 1995.

At Cornell University, developed a new 2-credit course for graduate students in Environmental Toxicology, Reproductive and Developmental Toxicology (TOX 611), first taught in fall of 1993. The course took a comparative approach to this area of toxicology considering diverse species from invertebrates to human. In addition to keynote lectures, a weekly discussion hour allowed students to explore recent research and controversial topics.

At Oregon State University, presented introductory lecture titled, "Cellular Injury and Adaptation or Death Following Toxicant Exposure" in team-taught graduate course in Molecular Toxicology (TOX 599), winter 2000.

Veterinary Teaching and Mentoring

Participated as a small group tutor in Block I of Cornell University's new veterinary curriculum, The Animal Body, Fall 1993 and 1994.

Presented lecture and laboratory on finfish histology and histopathology in Aquavet I, an introductory course in aquatic animal medicine taught in Woods Hole, MA, 1988-95.

Presented lecture and lab on neoplasia in finfish and diseases of freshwater finfish in Aquavet II, an advanced course in pathology of aquatic animals taught in Woods Hole, MA, 1990-95.

December 1991 presented 1-hour lecture on principles of aquatic animal health management to first year veterinary students in Foundations of Clinical Science at the College of Veterinary Medicine, Cornell University.

November 1994 led large group discussion of outbreak of *Saprolegnia* in tropical fish store with 2nd year veterinary students in Block IV, Host, Agents and Disease, Cornell University.

Spring of 1994 presented 1-hour lecture on epidemiologic studies of fish health in natural waters to students in Wildlife Medicine, Cornell University.

Lenore Menger-Anderson (Class of 1998) assisted in field and laboratory fish pathology research in summer and fall of 1994, Cornell University.

Kendal Harr (Class of 1995) assisted in fish pathology diagnostic work and research in the

summer of 1992. During the following year Kendal worked with Extension Associate Rod Getchell and me to create computer courseware for teaching aquatic animal health, Cornell University.

Ed Arrington (U.S. born black) (Class of 1994) assisted in developing lake trout cell lines during the summer of 1989, Cornell University.

Carmen Couret (U.S. born Hispanic) (Class of 1992) assisted in necropsy and in preparation of fish tissues for histology 1988-89, Cornell University.

Undergraduate Mentoring

Oregon State University:

Currently mentoring undergraduate student, Lalee Lo (U.S. born Asian), majoring in Bioresource Research in a senior research project investigating the role of inflammatory mediators induced by gastrointestinal infection with the nematode *Pseudocapillaria tomentosa* on the pathogenesis of hematologic abnormalities in zebrafish lines with inactivating mutations in orthologs to human Fanconi anemia genes.

Mentored visiting biology undergraduate student from Australia Nicholas Johnson in senior thesis research regarding carcinogenesis in zebrafish and the role of cytochrome P450 enzymes in the carcinogenesis process. Winter and Spring 2006.

Supervised Bioresource Research student Amber Taylor in yearlong research project exploring the roles of various cytochrome P450 enzymes in the carcinogenesis process, evaluating P450 protein expression using immunohistochemical procedures. Summer 2004-2005.

Supervised Bioresource Research student Michelle Zipperman in yearlong research project comparing different methods (immunohistochemical Tunel method versus light microscopic morphologic evaluation of 1 micrometer plastic tissue sections) for assessing cell death in carcinogen-treated fish tissues. Spring 1998-1999.

Supervised high school student Keri St. Clair who assisted with zebrafish cancer research, 2000-02.

Supervised undergraduate students Faunya Campbell, Lauren Brown and Renee Norred, who assisted in studies of spontaneous and carcinogen-induced tumors in zebrafish, 2002-2004.

Supervised undergraduate student Holland Banks who assisted in studies of neoplasia in zebrafish, 2004-2007.

Several undergraduate students participated in research projects in my laboratory at ***Cornell University:***

Christine Brosowski (Class of 1989) helped optimize culture conditions for lake trout cell line development in spring of 1989.

Ken Jenner (Class of 1991) assisted in lake trout cell line development and in attempts to stain osmoregulatory chloride cells in fish gill 1989-90.

Dan Rosen (Class of 1994) assisted in neurobehavioral toxicity studies in salmon 1990-91.

Tina Iamonte (Class of 1993) helped with neurobehavioral and other fish toxicity studies 1992-93.

Summer Research Apprentice Program for Minority High School Students at Cornell University

Edward Cheng (U.S. born Asian) helped in neurobehavioral toxicity studies in the summer of 1990.

Visiting Scientists Hosted at Cornell University

Suzana Juros-Marinovic, Center for Marine Research, Ruder Boskovic Institute, Zagreb, Croatia, used molecular techniques to investigate the possible role of viral agents in the lateral line syndrome of lake trout. She used molecular probes to viral agents and reverse transcriptase assays to search for evidence of virus in affected tissues. She also assisted in tumor transmission trials. July 1991-June 1992.

Dr. Steve Penningroth, formerly of the Department of Molecular Biology, University of Medicine and Dentistry of New Jersey, currently in the Department of Natural Resources at Cornell spent the summer of 1992 developing techniques for study of fathead minnow sperm to facilitate future reproductive toxicology research.

INSTITUTIONAL SERVICE AT CORNELL UNIVERSITY

Elected to 3-yr term on Curriculum Committee of College of Veterinary Medicine, Spring of 1994.

Member of Cornell University Veterinary College Library Committee, July 1990-July 1995

Participated in Veterinary College Block IV (Host, Agents and Defense) Curriculum Reform Committee, facilitating transition from traditional lecture-based teaching format to small group, case-based, socratic learning structure, Oct. 1991-July 1992.

Chairman of Seminar Committee in Department of Avian and Aquatic Animal Medicine, Cornell University, 1989-90.

Member of University-Wide Committee on Affirmative Action, Cornell University, Sept. 1991-June 1992.

Chairman of Environmental Toxicology Seminar Committee, July 1991-June 1992.

Member of Nomination Committee, Field of Environmental Toxicology, July 1992-95.

Participated in Faculty Focus Group regarding Cornell University's reward system for teaching, service and research as part of Cornell's strategic planning process, March 1993.

MANAGERIAL/SUPERVISORY DEVELOPMENT

Attendance at Programs Offered by Cornell University's Office of Human Resources:

1- or 2-day Seminars
Team Building, 1989
Improving Employee Performance, 1990
Mediation Skills, 1991
Working Smarter, Not Harder: Managing Time Effectively, 1992
Mastering the Challenge of Change, 1993

Semester-Long Program, 1 Day Per Week

Results-Oriented Supervision, 1990

Attendance at Programs Outside Cornell:

How to Manage Priorities and Meet Deadlines, 1-day short course, Fred Pryor Seminars, Rochester, NY, 1992.